BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF DELAWARE

IN THE MATTER OF THE APPLICATION OF DELMARVA POWER & LIGHT COMPANY, EXELON CORORPATION, PEPCO HOLDINGS INC., PURPLE ACQUISITION CORPORATION, EXELON ENERGY DELIVERY COMPANY, LLC AND SPECIAL PURPOSE ENTITY, LLC FOR APPROVALS UNDER THE PROVISIONS OF 26 *Del.* C. §§ 215 AND 1016 (FILED JUNE 18, 2014)	)))))))))	PSC DOCKET NO. 14-193

SECOND SUPPLEMENTAL TESTIMONY OF JEREMY FIRESTONE

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OF THE STATE OF DELAWARE

IN THE MATTER OF THE APPLICATION OF DELMARVA POWER & LIGHT COMPANY, EXELON CORORPATION, PEPCO HOLDINGS INC., PURPLE ACQUISITION CORPORATION, EXELON ENERGY DELIVERY COMPANY, LLC AND SPECIAL PURPOSE ENTITY, LLC FOR APPROVALS UNDER THE PROVISIONS OF 26 *Del.* C. §§ 215 AND 1016 (FILED JUNE 18, 2014)	)	PSC DOCKET NO. 14-193

Second Supplemental Testimony of Jeremy Firestone

August 29, 2016

1. Q. Please state your full name and address.

A. My name is Jeremy Mark Firestone. My home address is 130 Winslow Road, Newark, Delaware 19711.

2. Q. Do you also have a business address?

A. Yes, my business address is University of Delaware, 373 Harker ISE Lab, Newark, Delaware 19716.

3. Q. What is your position at the University of Delaware (UD)?

A. I am a Professor in the College of Earth, Ocean and Environment, School of Marine Science and Policy. I also am the Director of Center for Carbon-free Power Integration. I teach courses on US Renewable Energy and Climate Law and International Climate Change Policy, among other courses. Most of my research falls within social (perceptions, economic

preferences, cost-benefit and cost-effective analysis, and spatial planning) and regulatory dimensions of renewable energy.

4. Q. Have you previously submitted written testimony in this case?

A. Yes, I submitted written testimony in this case on December 12, 2014 and March 6, 2015.

5. Q. Why are you supplementing your testimony at this time?

A. I am testifying regarding my proposed allocation submitted on August 12, 2016, as amended. My proposed allocation, like other parties, evolved somewhat over time given discussions among the parties and attempts to narrow differences.

6 Q. Which materials did you review prior to providing supplemental testimony?

Prior to testifying, I primarily reviewed the parties' proposed allocations and a draft of the "Comparison of Most Favored Nations Benefit Recommendations," which includes parties' proposed allocations, as amended. I also reviewed the statutory standards under which the Commission evaluates mergers. Finally, I am familiar with renewable energy policies of the State of Delaware, including the Regional Greenhouse Gas Initiative (RGGI), the Delaware Renewable Portfolio Standards (RPS), and Integrative Resource Planning (IRP).

7. Q. Can you tell me where your proposal most differs with others?

A. Yes, I can.

(i). First, the Public Service Commission Staff (Staff), the Delaware Public Advocate (DPA), and the Delaware Department of Natural Resources and Environmental

Control (DNREC) propose that $8 million be dedicated to subsidize large commercial and industrial companies' adoption of energy efficiency measures; in contrast, I propose those $8 million in funds be dedicated to low income households that are Delmarva Power ratepayers. I also propose an additional $2 million for low-income households, which I will discuss later, bringing the total to $10 million.

(ii). The PSC Staff and DNREC propose that $4.0 million be dedicated toward a loosely defined endowed fund to advance the public interest (DPA opposes this fund); in contrast, I propose a more narrowly tailored fund of (a) $0.5 million that would be dedicated to a series of paired electric vehicle charging stations located strategically around the state; and (b) the remaining $3.5 million that would be dedicated to wind and solar academic research or training programs. These programs would be conditioned on the principle investigator being affiliated with the University of Delaware, Delaware State University or Delaware Tech, that those institutions match a minimum of 20% of the requested funds and that any overhead costs be limited, as they are for other state programs, to 38%, and that any such proposed research or training be shown that it would provide a benefit to Delmarva Power ratepayers.

(iii). The PSC Staff and DNREC propose to that $4 million be dedicated to fund the commercial and industrial Energy-Efficiency Investment Fund ("EEIF"), which would re-establish this program for Delmarva Power customers only, and that an additional $6 million be allocated to the Delaware Economic Department Office (DEDO) in an attempt to entice companies to bring jobs to Delaware, while DPA and I each propose that $8 million be dedicated to the EEIF fund. DPA shifts funds from the "public interest" projects to the EEIF while I allocate $4 million of the $6 million that

Staff and DNREC would allocate to DEDO to the EEIF, with the remaining $2 million to low income residential customers (again, as noted, bringing the total allocation to low income households to $10 million).

8. Q. Can you please elaborate on your opinion regarding the relative merits of dedicating $8.0 million to low income households rather than to large, commercial and industrial corporations?

A. In her testimony, the Joint Applicants' expert witness, Dr. Susan F. Tierney, noted that with regard to funds generally, the Commission could choose to make them available on "an "equal basis to all customers … or disproportionally in favor of those customers who receive fewer of the other types of benefits likely to flow from the Merger (e.g., to … low-income residential customers….) (at page 20). Rather than favoring those parties who receive the fewest benefits and who have the least ability to pay, as I do, the PSC staff, DNREC and DPA favor those with the greatest ability to pay their own way. They have not provided any factual support for the proposition that the largest corporations in this state such as JP Morgan Chase, Bank of America and Dow-Dupont would only choose to adopt energy efficiency measures if they were to receive large subsidies. These large subsidies may well simply provide a financial benefit to the recipients' shareholders (ironically resulting in a transfer of wealth from Exelon's shareholders to say JP Morgan Chase's shareholders) or alternatively enhanced bonuses to corporate managers. Indeed, research shows that the median time to achieve a return on investments in energy efficiency at existing buildings is a mere 1.1 years, with a benefit-cost ratio of 4.5.[1] Given that these corporations have deep pockets, unlike small firms, they have

[1] Evan Mills, Lawrence Berkeley National Lab, Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions (Prepared for the California Energy Commission, Public Interest

substantial funds on hand to make the needed capital investments, without the benefit of government largess. Rather than encouraging large corporations to rent-seek, the state should encourage its corporate community to join forward-looking corporations that go beyond energy efficiency and undertake voluntary measures such as buying carbon credits—that is, they pay for societal improvements rather than being subsidized by government to undertake private improvements. Those forward-looking firms do so to advance "corporate social responsibility," demonstrate "climate leadership," and engage customers and clients, and for branding.[2]

In contrast, those with low income pay a higher percentage of their income toward energy than the others. Indeed, the lowest quintile dedicates more than 11% of their household income to utility expenditures while the highest quintile dedicates less than 2%.[3] This raises equity issues. And while I enthusiastically support measures such as RGGI and RPS, I am also cognizant of the fact that these policies are regressive. Addressing energy inequity generally, and of RGGI and RPS program is not "welfare" but rather, simple fairness. The Congressional Budget Office (CBO), for example, has estimated the effects of a potential nationwide carbon cap and trade program on individuals and corporations.[4] For example, the CBO estimated that a 15 percent reduction in carbon emissions would result in a 3.3% increase in cost as a percentage of income for those households in the lowest quintile while only a 1.7% increase for those in the wealthiest quintile. If, however, revenues from the sale of carbon allowances were

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Energy Research (2009), available at http://cx.lbl.gov/2009-assessment.html. See Executive Summary and Table 4, p. 22.

[2] Forest Trends Ecosystem Marketplace, Ahead of the Curve: State of the Voluntary Carbon Markets 2015 Figure 13, p. 20, available at http://forest-trends.org/releases/uploads/SOVCM2015_FullReport.pdf

[3] Congressional Budget Office (CBO) by Terry Dinan, Offsetting a Carbon Tax's Costs on Low Income Households (2012), available at https://www.cbo.gov/sites/default/files/112th-congress-2011-2012/workingpaper/11-13LowIncomeOptions_0.pdf

[4] See e.g., Congressional Budget Office (CBO) by Terry Dinan, Trade-offs in Allocating Allowances for CO_2 Emissions, Economic and Budget Issue Brief, (April 25, 2007), available at https://www.cbo.gov/sites/default/files/110th-congress-2007-2008/reports/04-25-cap_trade.pdf

used to provide lump sum payments, the lowest quintile would see overall benefits of 1.8 % (rather than a 3.3% cost increase). On the other hand, the revenues were used to cut corporate taxes (having a similar effect to the subsidies provided here), the highest quintile would see benefits of 1.6% rather than a 1.7% decrease.

While the mechanics of such a targeted fund would need to be worked out and might be difficult for Exelon to do so on its own, the CBO has analyzed various mechanisms such as tax rebates, payroll tax rebates, earned income tax credits, and the Low Income Household Energy Assistance Program (LIHEAP) that could be employed. Thus, any such fund could be conditioned on the establishment of such a program either administratively or legislatively by a date certain (say five years from a final order) after which the funds could be re-distributed. Such a fund would be in the public interest, as compared to subsidizing multinational companies, which is in the private interest.

9. Q. Can you explain why you favor a narrowly tailored fund rather than a fund that could be used for any project that could be deemed in the "public interest."

A. To begin with, given that Delaware is a small state that already has two government entities—DNREC and the Sustainable Energy Utility—that provide information and education and that promote renewable energy policies it is not clear that such a broad fund would provide the best use of limited dollars. I prefer a much more narrowly tailored fund so that the money can be allocated efficiently and used effectively to benefit Delmarva Power ratepayers. I would limit any such fund to (i) research and training programs at (ii) one of the three state academic institutions; (ii) to wind and solar. This focus advances state institutions to which ratepayers' taxes are dedicated and examines that primary means of generating renewable

electricity in our regional grid and does so in the limited areas of research and training. In contrast to a broad request for proposals (RFP), which will be complicated and require large and perhaps unwieldy external evaluation teams to evaluate competing grant proposals, a focus on two areas—wind and solar—and two means—research and training—will be present a well-bounded evaluation process. Further, an explicit requirement of matching funds ensures that the recipients have skin in the game and the limitation on overhead ensures that Exelon dollars are primarily going toward research rather than overhead.

A further advantage of the more narrowly tailored program is the proposal to dedicate resources toward a specified purpose—paired (two per location) universal (so as not to favor one design of a charging plug over another) electric vehicle charging stations throughout the state. I propose that the funds be used not only for establishing the charging stations but for providing free charging for a period of five years as well. This program would build on a DNREC-University of Delaware partnership that deployed I believe five (unpaired) charging stations in the state with limited free charging (the funds I propose here could also be used to extend the limit period of free charging with the first five).

Some individuals may contend that electric vehicle charging stations should be privately financed. They however do so only by ignoring the "Catch-22." On the one hand, it is well-established that one of the largest impediments to electric vehicle adoption are range anxiety and the related concern over the lack of charging infrastructure.[5] Indeed, when consumers suffer from driving range anxiety, they are unlikely to consider purchasing an electric car.[6] One way to

[5] See e.g., Franke, T, et al., 2012. Adapting to the Range of an Electric Vehicle – The Relation of Experience to Subjectively Available Mobility Resources, https://www.researchgate.net/profile/Thomas_Franke/publication/257401389_Adapting_to_the_range_of_an_electric_vehicle_The_relation_of_experience_to_subjectively_available_mobility_resources/links/00b4952530c399ee58000000.pdf?origin=publication_detail

[6] Daziano, R. 2013. Conditional-logit Bayes Estimators for Consumer Valuation of Electric Vehicle Driving Range,

address consumer concerns is to establish a comprehensive network of public charging stations, which effectively extends the EV batteries.[7] Unfortunately, without the presence of such a comprehensive network, many individuals are reluctant to invest in electric vehicles. On the other hand, those controlling private capital are hesitant to invest in privately-owned charging stations unless and until there is a critical mass of electric vehicles on the road, which would allow them to recoup their investment. Electric vehicle charging stations thus present an example of the type of good that is best provided by government/public funds. Once a market for electric vehicles is established, it will be appropriate to transition to privatize charging.

Others might contend that the benefits of such a program will largely go to middle to upper quintiles because of the larger capital costs required for an electric vehicle. That contention has merit, but ignores the fact that (a) it will lead to more mass production of electric vehicles which will bring down the costs for all; (b) there are diffuse health benefits from removing mobile sources of air pollution from Delaware roads and (c) that this proposal is paired with $8 million to be dedicated to low income households

10. Q. Is land-based wind power feasible in Delaware or must Delaware solely rely on offshore wind power?

A. Newer wind turbine technology presents opportunity to have higher wind turbine hub heights where the winds are stronger, and newer composite materials for wind turbine blades

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Resource and Energy Economics, 35(3): 429-450, available at https://www.researchgate.net/profile/Ricardo_Daziano/publication/261171639_Conditional-logit_Bayes_estimators_for_consumer_valuation_of_electric_vehicle_driving_range/links/545140d40cf2bf864cba8f34.pdf

[7] Saxena, S., et al. 2015, Quantifying EV Battery End-of-life through Analysis of Travel Needs with Vehicle Powertrain Models, Journal of Power Sources, 282: 265-276, 275.

result in substantially large swept areas by the wind turbines. Wind maps[8] suggest that economically viable wind power project might be able to be developed in the southern part of the State. My preliminary work in this area suggests that a levelized cost of energy (LCOE) of around $83/MWh for a project that is 50% debt financed. This would provide Delaware with diverse fueled, price stable, and emissions-free generation that would also have the effect of suppressing prices more generally. Moreover, any such development, which would be on private property, would most likely be in rural parts of the state, and thus would provide rents and/or royalties to farmers who agree to lease small portions of their land for wind farming, benefiting the downstate economy as well and helping to maintain family farms; it would provide local tax benefits as well. Finally, when looking at the levelized costs of new generation and considering environmental damages, new wind power is substantially cheaper on a per kWh basis.[9] Further research into this promising technology, including spatial planning, regulatory, social and environmental considerations would be beneficial.

11. Q. Can you explain why you would have the Commission dedicate funds for energy efficiency upgrades rather than job growth?

A. Yes. It is my understanding based on past DNREC experience that $4 million will likely fund the EEIF for only about one year; my proposal would fund it for about two years with all the concomitant energy efficiency benefits. In contrast, sending funds to the non-Party DEDO, albeit with the nominal purpose of bringing jobs first to the natural gas infrastructure sector, and should any money be left over, to the energy efficiency sector, provides little

[8] See the Delaware map at 100m at http://usasolarwind.com/USA%20Wind%20Maps/Delaware/Delaware%20wind%20speed%20map%20100m.pdf; and national maps with hub heights at 110m and 140m are published by the US Department of Energy at http://apps2.eere.energy.gov/wind/windexchange/windmaps/resource_potential.asp.

[9] D.T. Shindell, The Social Cost of Atmospheric Release, *Climatic Change,* 10.1007/s10584-015-1343-0 (2015)

assurance of much of anything. To begin with, it is not clear how this vague proposal would work for natural gas infrastructure given that DEDO has specific grant, loan, training and tax incentive programs and Staff, DPA and DNREC have failed to provide a roadmap to any such program; Indeed, in its initial proposal, DPA, who originated the idea, acknowledges that there may be "no such DEDO program."

As for the back-up energy efficiency program, there is no assurance that energy will be used any more efficiently be Delawareans or Delaware businesses or that any Delawareans and Delaware businesses will be able to obtain energy efficiency contracting services at lower prices. In essence, the energy efficiency component is a jobs program masquerading as an energy efficiency program. And, even if successful, which is in doubt, it may not provide a single additional job to Delaware in that the General Assembly may simply decrease the state funds that it would otherwise allocate to DEDO by an amount equivalent to the funds the parties propose here to provide to DEDO.

Further, DEDO's track record in the electricity and natural gas sectors is far from encouraging. DEDO, for example, (a) sought to subsidize costs related to a data center and large natural gas (>250MW) power plant that were proposed to be located in the center of the City of Newark while forward-looking companies such as Google and Apple are building data centers powered with renewable energy; and (b) it subsidized the natural gas-powered Bloom Energy fuel cell project, which transferred substantial costs from Bloom to Delmarva Power ratepayers, much to the chagrin of the DPA, among others, and, it created complications for the Delaware RPS as well.

12. Q. Does this complete your second supplemental testimony today?

A. Yes.

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CERTIFICATE OF SERVICE

I hereby certify that on August 29, 2016, that on behalf of Jeremy Firestone, *Pro Se*, I filed Second Supplemental Testimony of Jeremy Firestone with Delafile and served a copy of the same on all persons on the email service list by email attachment.

Respectfully submitted,

Jeremy Firestone
29 August 2016